Background and Intended Use

The CDC-APHL International Influenza Laboratory Capacity Review Tool (IILCRT) is a data gathering tool to assess laboratory capabilities and capacities, with an emphasis on influenza diagnostics. Once analyzed, the information collected from this tool can be used to identify a laboratory's strengths and challenges. The IILCRT is intended to be used to conduct assessments prior to beginning any planning or in-country training for laboratory diagnostics. Capacity review with the IILCRT will be conducting during field visits to the laboratory in order to assess laboratory infrastructure, equipment, and conduct interviews with staff. The tool consists of ten modular sections which include:

- Laboratory Contact Information
- General Laboratory
- Virology Laboratory
- Molecular Biology Laboratory
- Influenza Testing
- Staff Training
- Specimen Handling, Collection, and Reporting
- Laboratory Safety and Biosafety
- Quality Assurance / Quality Control
- Recommended/Required Equipment and Reagents

The modular design of the tool allows for each of the sections described above to be administered independently, and/or by multiple persons if teams are completing the capacity review. The person(s) performing the capacity review, at a minimum, must have significant experience in virology (specifically influenza), molecular biology, and influenza diagnostics. In addition, it would be beneficial if the individual(s) performing the capacity review have experience training laboratory staff with both the CDC Human Influenza Virus Real-Time RT-PCR Detection and Characterization Panel and Swine Influenza Virus Real-Time RT-PCR Detection Panel (rRT-PCR Swine FluPanel) specifically, as well as training experience with other types of influenza diagnostics.

Suggested Protocol and Itinerary

International laboratory capacity review site visits are anticipated to last approximately four to five days contingent upon the number of capacity reviewers deployed to the laboratory, and the current capabilities and capacities of each laboratory. The components of each site visit will include a briefing or entrance interview, laboratory capacity review, hands-on technical assistance, and concluding with a debriefing. The debriefing will provide the stakeholders with a summary of the findings as well as recommendations from the capacity review. The following materials and equipment should be used during the capacity review; printed copy of the IILCRT, clip board, graph paper (for documenting the layout of the laboratory space), digital camera (if permitted), portable USB drive, PowerPoint presentation, laptop computer, and writing utensils.

Prior to beginning the capacity review process, the reviewer should draft a statement of work, and submit it to the host laboratory along with a copy of the IILCRT. Logistical arrangements should be made through APHL and the Centers for Disease Control and Prevention (CDC) Project Officer or other point of contact (e.g. APHL in-country contact). The work plan should be a comprehensive itinerary of who the reviewer would like to meet with and what they plan to do each day of the capacity review process. If possible, the review team should plan on meeting with the Laboratory Director, representatives from the Ministry of Health (MOH), and any major stakeholders or funders that are available. It is crucial that a briefing of the stakeholders be done prior to conducting the capacity review. The reviewer and CDC Project Officer (if applicable) should provide a brief presentation to the parties identified above to discuss the objective(s) of the laboratory capacity review. In this presentation the reviewer should note that following the capacity review an additional briefing will be done with the same stakeholders to present findings and recommendations from the review process. It is imperative that the reviewer conveys that the capacity review is not an assessment or comparison, but simply a means to document current laboratory capacity, identify key personnel, and recognize future needs. At minimum the presentation will:

- Define capacity review objective
- Define review components
    - Indentify key stakeholders
    - Develop the laboratory personnel contact list
    - Define surveillance system: syndromic and laboratory based
    - Outline the scope of diagnostic testing capacity
        - Virus isolation: eggs, cell culture
        - Molecular
        - Sequencing
        - Other respiratory viruses
    - Discuss how the capacity review will help to identify critical equipment, reagents, and supply needs
    - Discuss how the capacity review will assist in the identification of training needs

Following the presentation, the reviewer should determine whether there are specific questions or points to clarify. Prior to beginning the laboratory review, the reviewer should ascertain whether pictures and diagrams of the laboratory are permitted. Time permitting, the reviewer should embark on a brief laboratory tour to become oriented to the laboratory and make initial observations as to whether it seems organized, fully functional, etc. Following the capacity review, a detailed report should be prepared and submitted to both CDC and APHL, along with a copy of the IILCRT and any other relevant documents. Below is a recommended daily itinerary for each on-site laboratory capacity review.

- Day 1
    - Conduct introductory meetings and briefings with the CDC Project Officer, Laboratory Director, Ministry of Health, and if applicable other major stakeholders.
    - If possible embark on a brief tour of the laboratory.

- Day 2
    - Embark on a comprehensive laboratory tour, beginning capacity review.
- Day 3
    - Finalize capacity review.
    - Identify laboratory strengths and challenges.
    - Make other laboratory recommendations.
    - Prepare any necessary reagents, controls, and equipment for hands-on technical assistance.
- Day 4
    - Conduct hands-on technical assistance.
- Day 5
    - Conclude hands-on technical assistance.
    - Debrief CDC Project Officer, Laboratory Director, Ministry of Health representatives, APHL in-country contact (if applicable), and other major stakeholders (if applicable).

International Laboratory Capacity Review Tool

This section provides an overview of each module of the IILCRT. Although much of the tool is self explanatory, specific questions and prompts for each section will be highlighted. Many of the questions can be answered through keen observation during the laboratory walkthrough, while others may need to be acquired through staff interviews. Reviewers should have a printed hard copy of the tool to serve as a prompt while performing the on-site capacity review. If necessary, the reviewer is requested to add additional comments to any of the questions they determine would aid in the interpretation of the response. At all times during the review of the laboratory please note and highlight all exceptional practices that the laboratory employs, as well as any recommendations for improvement. The findings of the on-site capacity review should be entered electronically into the Microsoft Excel workbook file, and it is recommended that the reviewer enter the information immediately after the capacity review walkthrough.

Contact Information and Introductory Briefing

The purpose of this module it to capture all high level information regarding the function of the laboratory as well as gather information on the relevant contact points for the laboratory including the Laboratory Director, key staff, key contacts in the Ministry of Health, as well as key stakeholders and partner organizations.

The following sections highlight and provide additional guidance for the use of each of the modules included in the IILCRT.

General Laboratory

The module is intended to capture daily laboratory practices and operations to assess the overall functionality of the laboratory. This module includes a number of questions only to be answered following interviews with relevant laboratory staff. The remaining questions should be able to be answered by observation alone. More specifically, to assist the laboratory staff with answering question six regarding surveillance activities, the reviewer should prompt the staff person with questions such as: From whom does the laboratory receive specimens? Why? The National Influenza Center (NIC) serves what function?, and Whom does the laboratory provide information to (e.g. MOH, WHO, EuroFlu, etc.)?. Examples of information exchange capabilities as noted in question seven may include email, fax, phone, internet access, FTP sites, etc. Question thirty-one may be answered with brief statements which describe general activities and expectations. The remaining questions should not pose any difficulty for the reviewer.

Virology Laboratory

The purpose of the Virology Laboratory module is to assess specific activities the laboratory conducts in basic virology including growth, isolation, and practice. This module's importance is it to accurately capture details of the laboratory's current algorithm(s) for culturing specimens. Specifically, the reviewer should note whether influenza isolation rates are similar to what would be expected during a typical influenza season and whether there are a significant number of discrepancies between culture and PCR results.

Molecular Laboratory

The Molecular Laboratory module is intended to capture and assess specific practices and procedures the laboratory employs for molecular diagnostics. The reviewer should observe and assess whether there is a uni-directional workflow for nucleic acids in the laboratory. A uni-directional workflow is intended to prevent cross contamination and can be defined as a physical separation of pre and post PCR amplification work. Nucleic acids are extracted and handled in designated clean, amplicon free areas prior to diagnostic testing (e.g. RT-PCR), and handled only in designated "dirty," post-amplification areas following diagnostic testing. If the laboratory reports (question eleven) that they do not have a reliable source for Real-Time PCR reagents and supplies, the reviewer is requested to further probe staff to identify issues as to why. If possible, identify an alternate in-country or local distributor of equivalent reagents for the laboratory under review. As directed in question thirteen, the reviewer should verify that disposable pipette tips the laboratory uses properly fit their pipettors. Questions sixteen and seventeen direct the reviewer to inspect freezer storage. If necessary the reviewer should explain it is not recommended molecular biology practice to store PCR reagents, controls, and specimens together and stress the importance not to store critical reagents (enzymes) in frost-free freezers. The remaining questions should not pose any difficulty for the reviewer.

Influenza Testing

The influenza testing module is intended to capture specific information regarding the laboratory's practice and procedures for influenza diagnostic testing. Please note that if this IILCRT is being used to conduct a more generalized capacity review, this module may be omitted as it pertains exclusively to influenza diagnostic testing. There are a number of questions in this module with multiple sections; it is only necessary to record those sections that are applicable to the laboratory, please note not applicable (N/A) where needed. Question eight asks the reviewer to capture the standard operating procedure for setting up each RT-PCR. It is important to observe workflow, and how each 96-well plate/tray is set-up. This should include the number of unknowns and controls in addition to the well locations on each plate/tray. This is important so an accurate assessment of how the interpretation of the assay results is being conducted. The remaining questions should not pose any difficulty for the reviewer.

Laboratory Safety and Biosafety

The Laboratory Safety and Biosafety module is intended to identify safe laboratory practices employed in the laboratory as well as basic assessments of laboratory security. If the laboratory operates under multiple biosafety levels (BSL), please identify the approximate amount (percentage) of laboratory work performed at each biosafety level, as requested in question one. For example, the laboratory has BSL-2 and BSL-3 facilities, but ninety percent of the work is performed at BSL-2 with the remainder of operations using BSL-3 practices.

Training

The Training module is intended to capture all of the various trainings that laboratory staff undergo prior to beginning work in the laboratory as well as what (if any) annual or refresher trainings are given. Training topics include routine laboratory practice, safe laboratory practice, specimen handling, virology, molecular biology, etc. The reviewer is requested to identify the frequency of trainings (e.g. annual, semi-annual, etc.), which staff members are being trained (e.g. all staff, new staff, etc.), and whether training is mandatory or voluntary. If the reviewer determines training is voluntary, please indentify the approximate staff attendance/participation in the voluntary training(s). In addition, the reviewer should identify who provides the training (e.g. Laboratory Staff, PI, WHO, CDC, etc.) and where training is conducted (e.g. on-site, off-site, classroom, etc.). Other questions to consider for the general comments area should include whether the reviewer or laboratory staff feel there are unmet training needs, and whether there are specific training requests.

Specimen Handling, Collection, & Reporting

This module is intended to identify and capture all procedures and practices used by the laboratory in specimen handling, collection, and reporting. If possible the reviewer should document specifics relating to reporting such as whether or not results are reported electronically, and what the turnaround time from specimen receipt to reporting of the results is.

Quality Assurance

This module is designed to capture all quality assurance (QA) and quality control (QC) procedures and practices instituted in the laboratory. The QA/QC module may be adapted at the discretion of the reviewer to capture site specific information reflecting current strengths and weakness in QA/QC policies. For example, the use of a National Institute of Standards and Technologies (NIST) certified thermometer for monitoring temperature readings, policies to keep and maintain freezer temperature logs, and monitoring temperature trends. This information should be added to the General Comments and Notes section at the end of the module.

Equipment & Reagents

A list of required and recommended equipment and reagents has been provided to guide the reviewer in the identification of equipment, instruments, reagents, and supplies needed to utilize the CDC Human Influenza Virus Real-Time RT-PCR Detection and Characterization Panel and Swine Influenza Virus Real-Time RT-PCR Detection Panels (rRT-PCR Swine FluPanel). Please document whether equipment is in working order and whether or not there is a procedure for preventative maintenance.